

Claims

1. A method for making a junction comprising:

forming, on the surface of a semiconductor substrate, a thin film
5 containing an element that can be electrically activated within the
semiconductor substrate; and

applying light having an intensity peak at a wavelength longer than 375
nm (inclusive) on said semiconductor substrate so that said thin film is
selectively excited thereby to electrically activate said element within said thin
10 film.

2. The method for making a junction according to claim 1, wherein
said light applying step satisfies at least one of conditions that with respect to
the light absorptance of said thin film, assuming that the wavelength is λ (nm)
15 and the absorption ratio is A(%), at the wavelength ranging from 375 nm
(inclusive) to 500 nm, $A > 7E32\lambda^{-12.316}$; at the wavelength ranging from 500 nm
(inclusive) to 600 nm, $A > 2E19\lambda^{-7.278}$; at the wavelength ranging from 600 nm
(inclusive) to 700 nm, $A > 4E14\lambda^{-5.5849}$; and at the wavelength ranging from
700 nm (inclusive) to 800 nm, $A > 2E12\lambda^{-4.7773}$.

3. The method for making a junction according to claim 1, wherein
said light applying step satisfies at least one of conditions that with respect to
the light absorption coefficient of said thin film, assuming that the wavelength is
 λ (nm) and the absorption coefficient is α (cm⁻¹), at the wavelength ranging from
25 375 nm (inclusive) to 500 nm, $\alpha > 1E38\lambda^{-12.505}$; at the wavelength ranging from

500 nm (inclusive) to 600 nm, $\alpha > 1E24\lambda^{-7.2684}$; at the wavelength ranging from 600 nm (inclusive) to 700 nm, $\alpha > 2E19\lambda^{-5.5873}$; and at the wavelength ranging from 700 nm (inclusive) to 800 nm, $\alpha > 1E17\lambda^{-4.7782}$.

5 4. The method for making a junction according to any one of claims 1 to 3, characterized in that said semiconductor substrate is an N-type silicon (Si) substrate, and said impurity is boron to be supplied to the surface of said Si substrate.

10 5. The method for making a junction according to any one of claims 1 to 4, characterized in that the light having an intensity peak at a wavelength ranging from 375 nm (inclusive) to 800 nm (inclusive) is a xenon flash lamp light.

15 6. The method for making a junction according to any one of claims 1 to 5 comprising the steps of:

 introducing boron as impurities in an n-Si(100) substrate and an n-Si(100) substrate with a plane inclined by several degrees by plasma doping; and
 applying laser light from 375 nm (inclusive) to 800 nm (inclusive) to said
20 boron-introduced n-Si(100) substrate so that the boron is electrically activated, characterized in that said boron-introduced n-Si(100) substrate has a light absorptance of $A > 1E19\lambda^{-6.833}$ for the light at the wavelength ranging from 375 nm (inclusive) to 800 nm(inclusive).

25 7. The method for making a junction according to any one of claims 1

to 6 comprising the steps of:

introducing boron as impurities in an n-Si(100) substrate and an n-Si (100) substrate with a plane inclined by several degrees by plasma doping; and
applying laser light from 375 nm (inclusive) to 800 nm (inclusive) to said
5 boron-introduced n-Si(100) substrate so that the boron is electrically activated, characterized in that said boron-introduced n-Si(100) substrate has a light absorption coefficient of $\alpha > 1E19\lambda^{-7.1693}$ for the light from 375 nm (inclusive) to 800 nm(inclusive).

10 8. The method for making a junction according to any one of claims 1 to 7, characterized in that said impurity introducing step is to apply plasma containing boron diluted with He to the n-Si(100) substrate and n-Si (100) substrate with a plane inclined by several degrees, for its plasma doping.

15 9. The method for making a junction according to any one of claims 3 to 8, characterized in that said light absorption coefficient is measured by an ellipsometer with an incident angle of 70 degrees for a three-layer structure consisting of air, said thin film and said semiconductor substrate.

20 10. The method for making a junction according to any one of claims 2 and 4 to 8, characterized in that after the light absorption coefficient and the thickness of the boron-introduced layer have been measured by an ellipsometer with an incident angle of 70 degrees for a three-layer structure consisting of air, said thin film and said semiconductor substrate, assuming that
25 the thickness of the boron-introduced layer is D (cm), said light absorptance is

computed as $A = 100 \times (1 - \exp(-\alpha \cdot D))$.

11. A method for making a junction by introducing impurities in a solid substrate and thereafter applying an electromagnetic wave to said substrate so as to activate the impurities, characterized in that prior to said light irradiation, He plasma, Ar plasma, plasma containing He or plasma containing Ar is applied.

12. A method for making a junction by introducing impurities in a semiconductor substrate and thereafter applying an electromagnetic wave to said semiconductor substrate so as to activate the impurities according to any one of claims 1 to 11, characterized in that prior to said light application, carried out is a combination of steps of applying He plasma, Ar plasma, plasma containing He or plasma containing Ar to said semiconductor substrate, and applying the plasma containing particles serving as impurities to the solid substrate, for its plasma doping.

13. The method for making a junction according to claims 1 to 12, wherein said substrate is an SOI substrate with a Si thin film formed on the surface.

14. The method for making a junction according to claims 1 to 12, wherein said substrate is a distorted Si substrate with a Si film formed on the surface.

15. The method for making a junction according to claims 1 to 12, wherein said substrate is a glass substrate with a poly-Si thin film formed on the surface.

5 16. The processed material formed by the method for making a junction according to claims 1 to 15.